Influence of heating conditions and ascorbic acid concentration over furan formation in starchy model systems

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Furan, a potential carcinogen, can be formed in foods processed at high temperatures such as coffee, baby foods, bread and snacks. Although there is still no clarity about the risks associated with the current intake levels of dietary furan, to limit the furan occurrence in foods may be considered as a challenge in the prevention of human diseases as cancer.
Considering that heat processed starchy products are characterized by their high worldwide consumption, we decided to dig into the mechanisms that would define their final content of furan.
The present study explored the effect of heating conditions (frying and baking) and ascorbic acid concentration over furan occurrence in a starchy model system.
Two different formulations of wheat flour dough (WF: wheat flour and WF-AA: wheat flour and ascorbic acid) were prepared with a 40 % of moisture (wb). Then, dough were cut in circle chips (40 mm of diameter ; 2.3 mm of thickness) which were fried and baked at 170°C and 200°C for 5, 7 and 9 minutes. Furan contents of heat processed products were quantified by GC-MS.
WF fried products contained higher furan levels than baked ones for all different processing times (*e.g.* 97 % higher furan in 5 minutes fried chips). For the case of WF-AA chips baking produced more furan compared to the frying (*e.g.* 58 % higher furan in 7 minutes baked chips). For all process conditions ascorbic acid addition produced an increase in furan levels (~17%-58% in frying and ~74-98 % in baking).
As for Maillard reactions in general, for all samples, an increase in furan level was observed when the moisture content decreased. Additionally, in fried products furan level was directly proportional to their oil uptake.
We conclude that for the present model conditions, ascorbic acid improves the furan generation, having a stronger effect in baked products.

We also propose that while lipid oxidation has been considered as one of main furan generation routes, for this particular case, it should not have a greater influence over furan formation; since frying experiments were realized with commercial sunflower oil with added antioxidant. Finally, considering that furan is an unpolar compound, for fried product the oil uptake may be responsible for the higher furan retention.